CLAIMS

1. A fairing intended to fair an elongate object intended to be at least partially immersed, characterized in that it comprises a plurality of fairing portions (12), each fairing portion (12) comprising a plurality of fairing elements (13), the fairing elements comprising a canal (16) intended to accept the elongate object and being profiled in such a way as to reduce the hydrodynamic drag of the at least partially immersed elongate object, said fairing elements (13) being intended to be pivot-mounted on the elongate element around the longitudinal axis of the canal (16), said fairing elements (13) being connected to one another along the axis of the canal and being articulated to one another, the fairing portions (12) being free to rotate with respect to one another about the canal, in which, the fairing elements of one and the same fairing portion are joined together by means of a plurality of individual coupling devices (19), each individual coupling device allowing one of the fairing elements of said portion to be connected to another fairing element of said portion which is adjacent to said fairing element.

2. The fairing as claimed in claim 1, in which the fairing portions have respective heights along the axis of the canal, these heights being defined as a function of the angular stiffnesses k of the respective fairing portions, and as a function of the chord length LC of said fairing elements of said respective portions so as to prevent a full twist from forming on said respective portions.

3. The fairing as claimed in claim 1 or 2, in which at least one fairing portion has a height along the axis of the canal, which height is defined as a function of the angular stiffness k of said fairing portion, and as a function of the chord length LC of said fairing elements of said portion so as to prevent an airborne full twist from forming on said fairing portion when the fairing portion is subjected to a torque below or equal to a predetermined torque.

4. The fairing as claimed in claim 1, in which at least one portion has a height along the axis of the canal, which height is defined as a function of the angular stiffness k of said fairing portion, as a function of the chord length LC of said fairing elements of said portion, so that the portion is able to undergo a full twist and so as to prevent an airborne full twist from forming on said fairing portion when the fairing portion is subjected to a torque below or equal to a predetermined torque.

5. The fairing as claimed in any one of claims 2 to 4, in which the fairing portions have respective heights that are less than a maximum height hmax such that:

$$hmax \leq \frac{\pi * k}{F\ LC^2}$$

where F is a constant comprised between 250 and 500.

6. The fairing as claimed in any one of the preceding claims, in which at least one of said portions, comprises at least one end fairing element, adjacent to one single other fairing element belonging to said portion, being a mitered fairing element, a mitered element being configured so that it has a bearing edge comprising a first bearing edge (Bza) which is mitered with respect to the leading edge (BA), the first bearing edge (Bza) being arranged in such a way that the distance between the leading edge (BA) and the first bearing edge (Bza), considered perpendicular to the leading edge (BA), decreases continuously, along an axis parallel to the leading edge, from a first end (E1) of the first bearing edge (Bza) to a second end (E2) of the first bearing edge (Bza), further away from another fairing element (130b), adjacent to the mitered fairing element and belonging to the same portion as the mitered fairing element, than the first end (E1), along the axis parallel to the leading edge.

7. The fairing as claimed in claim 6, in which each mitered fairing element is an end fairing element.

8. The fairing as claimed in any of claims 6 and 7, in which the end fairing element is sized in such a way as to be more resistant to a pressure loading, applied in a direction perpendicular, to the leading edge and connecting the leading edge to the trailing edge, than the other fairing elements of the portion.

9. The fairing as claimed in claim 6, in which the end fairing element comprises two parts (231, 232) back to back along the first bearing edge (Bzb), the end fairing element being configured to be kept in a deployed configuration when subjected to the hydrodynamic flow of the water, the two parts (231, 232) being arranged, relative to one another about the first bearing edge (Bzb), in such a way that the end fairing element has a trailing edge parallel to the leading edge (BA) and a cross section that is constant along the leading edge, and configured in such a way as to allow relative pivoting between the two parts (231, 232) about the first bearing edge (Bzb) when a torque inducing relative pivoting between the two parts (231, 232), applied about an axis formed by the first bearing edge (Bzb), exceeds a predetermined threshold so that the end fairing element passes from the deployed configuration into a configuration folded about the bearing edge.

10. The fairing as claimed in any one of claims 6 to 9, in which the bearing edge is the trailing edge.

11. A faired elongate element intended to be at least partially immersed, comprising an elongate element faired by means of the fairing as claimed in any of the preceding claims, the elongate element being received in the canal (16), said fairing elements (13) being pivot-mounted on the elongate element about the longitudinal axis of the canal (16) and being translationally immobilized with respect to the elongate element along the axis of the elongate element.

12. A towing assembly comprising a faired elongate element as claimed in the preceding claim and a towing and handling device intended to tow the faired elongate element while the latter is partially immersed, the towing device comprising a winch (5) allowing the faired elongate element (1) to be wound in and paid out through a guide device (4) that allows the elongate element (1) to be guided.

13. The towing assembly as claimed in the preceding claim, in which the guide device (4) is configured in such a way as to make it possible to modify the orientation of a fairing element (13a) of the fairing (12) with respect to the guide device (4) by rotation of the fairing element (13a) about the axis of the elongate element (1) under the effect of the traction of the elongate element (1) with respect to the guide device (4), when the fairing element (13a) exhibits an orientation in which it is bearing on the guide device (4) and in which the line of action of the force applied by the elongate element (1) to the pulley (4) extends substantially along an axis extending from the axis of the elongate element as far as the trailing edge (BF).

14. The towing assembly as claimed in the preceding claim, in which the guide device comprising a first groove (24), the bottom (26) of which is formed by the bottom of the groove of a pulley (4), the first groove (24) being delimited by a first surface (25) having a profile that is concave in a radial plane of the pulley, the width of the first groove and the curvature of the profile of the first curved surface in the radial plane being determined so as to allow the fairing element to be flipped by the rotating of the fairing element about the axis of the elongate element x under the effect of the traction of the elongate element with respect to the guide device along the longitudinal axis thereof, from a turned-over position in which the fairing element is oriented with its trailing edge toward the bottom of the first groove into an acceptable position in which it is oriented with the leading edge toward the bottom of the first groove.

15. The towing assembly as claimed in either one of claims 13 and 14, in which the fairing elements comprise a fairing element comprising a nose (14) accepting the elongate element and comprising a leading edge (BA), a tail (15) of streamlined shape extending from the nose (14) and comprising a trailing edge (BF), the first curved surface forming a first concave curve in the radial plane of the pulley, the concave first curve being defined in a radial plane (BB) of the pulley such that, when the fairing element extends with the leading edge (BA) perpendicular to the radial plane (BB), whatever the position of a fairing element in the first groove (24), when the nose (14) of the fairing element (13) is bearing on the concave first curve and the elongate element (1) is exerting on the fairing element (13), in the radial plane, a force to press the nose (14) of the fairing element (13) against the pulley, said pressing force Fp comprising a component CP perpendicular to the axis of the pulley and a lateral component CL, the trailing edge (BF) of the fairing element (13) is not in contact with the concave first curve or is in contact with a part (251) of the concave first curve that forms, with a straight line dp of the radial plane perpendicular to the axis xa extending from the axis of the elongate element x as far as the trailing edge of the fairing element, an angle γ that is at least equal to an angle of slip αt. The angle of slip is given by the following formula:

$$\alpha t = \mathrm{Arctan}\,(Cf)$$

where Cf is the coefficient of friction between the material that forms the exterior part of the tail of the fairing element and the material that forms the surface delimiting the groove of the pulley.